

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, DC 20554

In the Matter of

WorldVu Satellites Limited)	IBFS File No. SES-LIC-20190422-00538
)	Call Sign: E190236
Gateway Earth Station License Application)	

RESPONSE OF WORLDTVU SATELLITES LIMITED

WorldVu Satellites Limited (“OneWeb”) respectfully submits this Response to the comments filed by Space Exploration Holdings, LLC (“SpaceX”) in response to OneWeb’s application for a Ka-band gateway earth station in Santa Paula, CA.¹

In April 2019, OneWeb filed the above-captioned application for authority to operate a Ka-band gateway earth station in Santa Paula, CA.² These gateway facilities will be a critical part of OneWeb’s network infrastructure as it prepares to commence commercial service. Following the successful launch of the first six satellites in OneWeb’s non-geostationary orbit, fixed-satellite service (“NGSO FSS”) system in February 2019³ and the July 2019 opening of OneWeb’s state-of-the-art satellite manufacturing facility in Florida, the implementation of OneWeb’s U.S. gateway facilities is the next phase of OneWeb’s efforts to deliver innovative connectivity solutions to U.S. consumers.

¹ See WorldVu Satellites Limited, IBFS File No. SES-LIC-20190422-00538 (filed Apr. 22, 2019) (“Santa Paula Earth Station Application”); see also Comments of Space Exploration Holdings, LLC, IBFS File No. SES-LIC-20190422-00538 (Aug. 23, 2019) (“SpaceX Comments”).

² See Santa Paula Earth Station Application. OneWeb has also filed three other gateway earth station applications with the Commission. See WorldVu Satellites Limited, IBFS File No. SES-LIC-20180604-01082 (Call Sign E180620); see also IBFS File No. SES-LIC-20180727-02075 (Call Sign E181293) and IBFS File No. SES-LIC-20180727-02076 (Call Sign E181294).

³ All six OneWeb satellites have proven fully operational through extensive and successful testing and remain in orbit.

In its comments, SpaceX asks the Commission to require OneWeb to supplement the record with additional showings demonstrating that a minimum elevation angle (“MEA”) of five degrees will not “present any significant interference problems.”⁴ As demonstrated below, the Santa Paula Earth Station Application is entirely consistent with OneWeb’s International Telecommunication Union (“ITU”) filings that have received a “favorable” finding. Consequently, operation of the Santa Paula Earth Station will satisfy the Commission’s applicable EPFD limits and presents no threat of interference to the geostationary orbit (“GSO”) arc. Similarly, grant of the Santa Paula Earth Station Application would not negatively impact the NGSO spectrum sharing environment contemplated in OneWeb’s grant of U.S. market access.⁵ Therefore, expeditious grant of the Santa Paula Earth Station Application continues to be in the public interest.

I. THE SANTA PAULA EARTH STATION APPLICATION IS CONSISTENT WITH ONEWEB’S ITU FILINGS AND ADEQUATELY PROTECTS GSO OPERATORS

Section 25.146(c) of the Commission’s rules requires NGSO licensees or U.S. market access grantees to receive a “favorable” or “qualified favorable” finding by the ITU Radiocommunications Bureau regarding compliance with applicable EPFD limits prior to commencing operations.⁶ As the Commission has pointed out, an ITU “favorable” or “qualified favorable” finding demonstrates that the NGSO licensee or U.S. market access grantee will

⁴ SpaceX Comments at 4. SpaceX also submitted—on a grossly untimely basis—the SpaceX Comments in the dockets for the pending gateway earth stations referenced in n. 2 above.

⁵ See *WorldVu Satellites Limited, Petition for a Declaratory Ruling Granting Access to the U.S. Market for the OneWeb NGSO FSS System*, Order and Declaratory Ruling, 32 FCC Rcd 5366 (2017).

⁶ 47 C.F.R. § 25.146(c).

adequately protect satellites in GSO.⁷ Notably, this is the same requirement for which SpaceX sought a waiver with respect to its recently modified NGSO constellation.⁸ Unlike SpaceX, OneWeb has already received a “favorable” finding for its planned operations from the ITU Radiocommunications Bureau regarding its EPFD compliance, a finding that was issued based on data indicating a minimum elevation angle of *five* degrees—precisely the parameters described in the Santa Paula Earth Station Application.⁹ Given that the Commission has made clear that compliance with applicable EPFD limits is sufficient to protect GSO operations, OneWeb has satisfied its obligations to protect GSO operators.¹⁰ OneWeb’s intent and ability to fully protect GSO operations is well-documented and any suggestion by SpaceX to the contrary is without merit.¹¹

⁷ See *Update to Parts 2 and 25 Concerning Non-Geostationary, Fixed-Satellite Service Systems and Related Matters*, Report and Order and Further Notice of Proposed Rulemaking, 32 FCC Rcd 7809 at ¶¶ 32-35 (2017) (“NGSO Order”).

⁸ See *Space Exploration Holdings, LLC, Request for Modification of the Authorization for the SpaceX NGSO Satellite System*, Order and Authorization, 34 FCC Rcd 2526 at ¶ 28 (2019) (“Modification Order”).

⁹ The EPFD files demonstrating OneWeb’s compliance with the ITU’s EPFD obligations are publicly available. See *EPFD data and EPFD examination results*, INTERNATIONAL TELECOMMUNICATION UNION, <https://www.itu.int/ITU-R/go/space-epfd-data> (last visited Sep. 5, 2019).

¹⁰ See NGSO Order at ¶ 32 (“Any NGSO FSS System operating in compliance with these limits is considered as having fulfilled its obligation under Article 22 of the ITU Radio Regulations not to cause unacceptable interference to any GSO network”). Unsurprisingly, not a single GSO operator has raised concerns about any of OneWeb’s gateway earth stations causing interference to GSO operations.

¹¹ SpaceX briefly raises the issue of potential interference to terrestrial operators, but neither outlines its concerns nor makes a request for further information. OneWeb highlights that the required terrestrial coordination in the Ka-band performed by Comsearch and included in its publicly-available report was conducted using a five degree MEA. See *Santa Paula Earth Station Application*, Exhibit B at 4. Similarly, OneWeb assumed this same elevation angle for its UMFUS analysis in conformity with Commission rules. See *Santa Paula Earth Station*

II. THE SANTA PAULA EARTH STATION WILL NOT ADVERSELY AFFECT THE NGSO INTERFERENCE ENVIRONMENT

In addition to its lack of impact on GSO operators, grant of the Santa Paula Earth Station Application would not negatively impact the NGSO interference environment. The analysis provided below demonstrates the immaterial interference impact of the Santa Paula Earth Station Application and proves “that the proposed change does not present any significant interference problems.”¹² I/N statistics, shown below in the form of a Cumulative Distribution Function (“CDF”), illustrate potential interference from the OneWeb system into that of SpaceX. These graphs show the predicted I/N levels in the abscissa (X-axis) that are exceeded for a percentage of the time in the ordinate (Y-axis). Figure A shows uplink interference and Figure B shows downlink interference under the conservative assumption that neither NGSO FSS system employs interference mitigation techniques. The two curves on each figure represent the case where the OneWeb system operates with a 15 degree MEA in blue and with a five degree MEA in orange. Additional assumptions made for this analysis are shown below.

For downlink interference from OneWeb satellites to a SpaceX earth station:

1. The OneWeb earth station is collocated with the SpaceX earth station at Santa Paula, CA.
2. The SpaceX earth station can communicate with any satellite in its own system that meets the GSO avoidance angle and 25 degree minimum elevation angle criteria.
3. The OneWeb system operates up to 20 co-frequency beams per Ka-band spot beam, originating from satellites that meet the GSO avoidance angle and the stated minimum

Application, Exhibit A at 7-8; 47 C.F.R. 25.136(a)(4). OneWeb received no objections to its proposed operations, which it previously demonstrated were compliant with applicable power flux density limits set forth in Section 25.208 of the Commission’s rules. *See* WorldVu Satellites Limited, Petition for Declaratory Ruling, IBFS File No. SAT-LOI-20160428-00041, Technical Annex at 24-25 (Apr. 28, 2016).

¹² SpaceX Comments at 4.

elevation angle. SpaceX satellites are chosen based on random selection for consideration in evaluating the I/N CDF.

For uplink interference from OneWeb earth stations to victim satellites:

1. The OneWeb earth station is collocated with the SpaceX earth station at Santa Paula, CA.
2. The SpaceX earth station can communicate with any satellite in its own system that meets the GSO avoidance angle and 25 degree minimum elevation angle criteria.
3. The OneWeb system operates up to 20 co-frequency beams in Ka-band from its earth station, and any satellite in view meeting the GSO avoidance angle and the minimum elevation angle is eligible. SpaceX satellites are chosen based on random selection for consideration in evaluating the I/N CDF.

FIGURE A

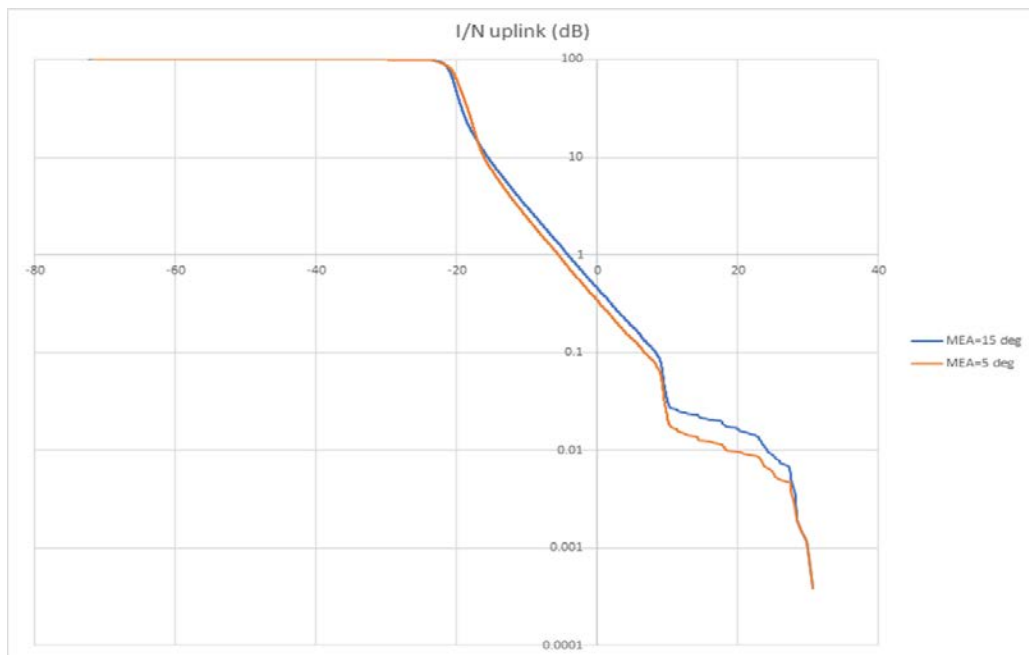
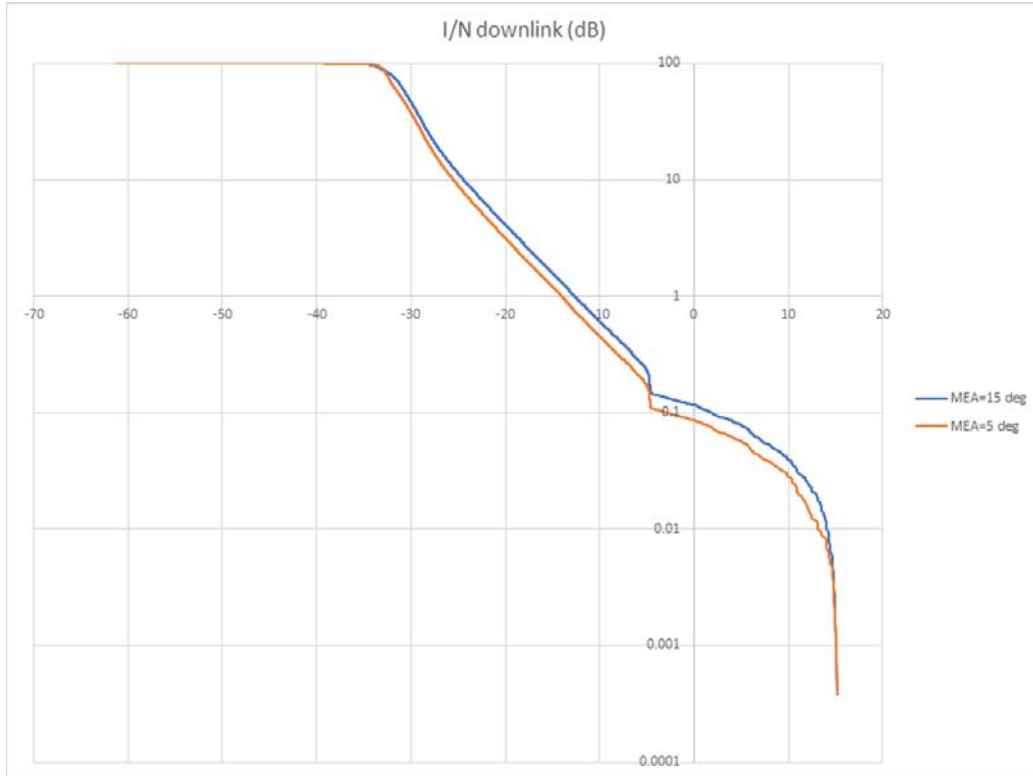


FIGURE B



Figures A and B demonstrate that utilizing a five degree MEA (as described in the Santa Paula Earth Station Application) actually *improves* the interference environment for the vast majority of the time. There is only a small portion of the curve in which a five degree MEA would have a slight negative effect as compared to a 15 degree MEA—however, even for this small percentage of time, the I/N values are well below -12.2 dB (which is identical to the Commission’s NGSO band-splitting trigger of $\Delta T/T$ of six).¹³ Accordingly, operation of the Santa Paula Earth Station with a five degree MEA would result in no significant increase in interference levels, and critically, no increase in in-line interference event probabilities.

¹³ See Section 25.261(c).

Contrary to suggestions made by SpaceX, the parameters in the Santa Paula Earth Station Application would improve the NGSO sharing environment for the vast majority of instances.

III. CONCLUSION

As demonstrated herein, the Santa Paula Earth Station Application will not negatively impact any other Ka-band spectrum users, including terrestrial systems.¹⁴ OneWeb’s “favorable” finding from the ITU Radiocommunications Bureau, based on parameters consistent with the Santa Paula Earth Station Application, demonstrates its ability to protect GSO operations. In addition, grant of the Santa Paula Earth Station Application would not materially impact the NGSO sharing environment. Accordingly, SpaceX’s concerns are unsubstantiated and should be disregarded. Grant of the Santa Paula Earth Station Application remains in the public interest and OneWeb respectfully requests expeditious Commission action in order to continue building out its network infrastructure as it prepares to offer innovative, satellite-based connectivity services to consumers across the *entire* United States in the near future.

Respectfully submitted,

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September 5, 2019

¹⁴ As demonstrated in n. 11 above, OneWeb’s terrestrial analyses were conducted using a five degree MEA.

**CERTIFICATION OF PERSON RESPONSIBLE FOR PREPARING ENGINEERING
INFORMATION**

I hereby certify that I am the technically qualified person responsible for preparation of the engineering information contained in this Response of WorldVu Satellites Limited, that I am familiar with Part 25 of the Commission's rules, that I have either prepared or reviewed the engineering information submitted in this pleading, and that it is complete and accurate to the best of my knowledge and belief.

Date: September 5, 2019

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CERTIFICATE OF SERVICE

I, Samuel Swoyer, hereby certify that on this 5th day of September 2019, a copy of the foregoing

Response is being sent via first class, U.S. Mail, postage paid, to the following:

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